Observations on the Behaviour and Taxonomy of the Australian Tailless Whipscorpion *Charinus pescotti* Dunn (Amblypygi: Charontidae)

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The male of *Charinus pescotti* Dunn, 1949 is described and the female figured. An unusual prey capture technique involving the whip-like first legs is described and a relationship between small brood size and longevity is suggested.

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INTRODUCTION

The Amblypygi are widely distributed in the warmer tropical regions of the world. In Australia they are poorly represented and their presence has generally been overlooked in revisions of the group. The following notes aim to better characterize the Australian species *Charinus pescotti* Dunn from both taxonomic and behavioural viewpoints. The behavioural observations were made by M. L. Robinson.

TAXONOMY

Weygoldt (1972) established the circumtropical nature of the distribution of the genus *Charinus* Simon. However, in his list and key to species of *Charinus* he does not mention *C. pescotti* or the presence of the genus in Australia.

Two species of Amblypygi have been described from Australia. They are *Charon annulipes* Lauterer, 1895 and *Charinus pescotti* Dunn, 1949. The status and affinities of *Ch. annulipes* (type locality Brisbane, Queensland) are uncertain. The description is inadequate, the deposition of the type specimen is unknown and no additional material has ever been collected. The latter suggests that either the specimen was accidentally introduced or a locality data error has occurred. *C. pescotti* occurs in rainforest habitats in north Queensland. The female holotype comes from Barron Falls near Cairns. More recent collections have been made in rainforest localities between Cairns and Cooktown (Monteith, 1965; Baehr, 1974). In addition, Monteith (1964) attributed to *C. pescotti* specimens from a separate, more northerly rainforest region east of Coen on Cape York Peninsula. This material has not been seen but warrants reexamination to confirm the conspecificity of these two disjunct groups.

Here, the male of *C. pescotti* is described for the first time and the description of the female given by Dunn (1949) is augmented with several diagrams (Figs 5-11). The female illustrated comes from the Cape Tribulation area, north Queensland. Some size and colour variation is apparent in specimens from different localities but in other respects resemblance is very close. Dunn (1949) nominated several specimens from the Solomon Islands as paratypes of *C. pescotti* (in Dominion Museum, New Zealand). However, his comments on differences in pedipalpal armature between these and the Australian holotype suggest that the Solomon Island sample could represent a different species.

All measurements given below are in millimetres.

Charinus pescotti Dunn, 1949

Charinus pescotti Dunn, 1949:8. Monteith, 1965:87. Baehr, 1974: 101

Types: Holotype female: Barron Falls near Cairns, Queensland, G. F. Hill, about 1923 (in National Museum of Victoria, not seen). **Metallotype** male. **(New designation):** 2km WNW of Cape Tribulation, Queensland, 23.9.-7.10.1982, Monteith, Yeates and Thompson (in Queensland Museum).

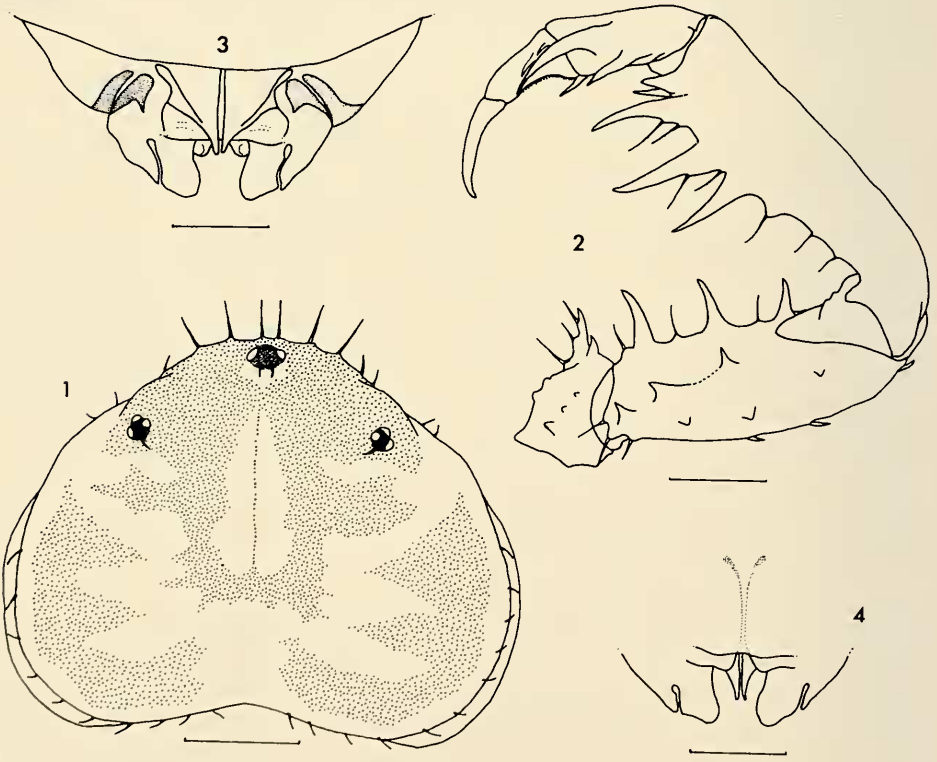
Diagnosis: Spiniform bristles and spines on carapace and pedipalps. Pedipalpal tarsus with 2 teeth prolaterally, distal tooth largest. Basitarsus longer than tarsus. Proximal tarsal segment only slightly longer than remaining segments together. Basitarsus 4 with 16 trichobothria, laterodistal rows 5, 5. Female genitalia with an anterior sclerite. Male genitalia with lateral lobes divided distally into two parts.

Dimorphism: Males and females are similar in general morphology. However, the pedipalpi are longer in relation to carapace width in males than in females. Ratio carapace width to length of palpal femur plus tibia: ♀ ca 0.80:1; ♂ ca 0.65:1.

Description of MALE metallotype (Figs 1-4)

Carapace length 3.53, width 4.41. Abdomen length 4.80, width 3.68.

Carapace punctate, spiniform bristles placed along anterior margin, central 6 largest; colour reddish brown with greyish patches on cephalic, foveal and lateral thoracic areas. Abdomen light orange-brown with a median and two lateral greyish patches on each segment. Legs indistinctly banded, brownish-grey. Pedipalps orange-grey.



Figs 1-4. Charinus pescotti, male. Scale lines = 1mm. 1. Carapace. 2. Pedipalp, prolateral. 3. Genitalia, ventral. 4. Genitalia, dorsal.

Eye group width 2.42. Anterior pair of eyes on low tubercle with 2 small bristles posteriorly; anterior eyes separated by 1.5 times their diameter. A single bristle behind each lateral eye triad.

Chelicerae with 5 prolateral teeth, basal tooth largest, two distal teeth fused at base. Pedipalpi relatively short but longer than in female; male femur about as long as carapace. Femur length 3.48; tibia length 4.00. Distribution of spur-like teeth on pedipalps (p = prolateral, r = retrolateral): coxa 2r; femur 3p, 3r; tibia 4p, 2r; basitarsus 2p, 1r; tarsus 2p (distal tooth largest). Pedipalpal spines and bristles spiniform. Prosternum prong-like, anteriorly with a pair of long apical bristles and several basal bristles (ca 10-12). Meso- and metasternum both with 4 bristles, a larger lateral pair and a smaller medial pair. Abdominal pedicel with a pair of bristles.

Leg lengths (both second legs damaged — lack post-patellar segments):

	Femur	Patella	Tibia	Basitarsus	Tarsus
1	6.68	0.57	12.14	1.07	9.74
2	4.35	0.90	—	—	—
3	5.00	0.94	4.10	2.21	1.70
4	4.26	0.84	4.21	2.01	1.64

Tibia 4, length of subsegments: proximal 2.07, middle 0.62, distal 1.52. Proximal tarsal segment of legs 3, 4 (tarsi 2 missing) slightly longer than combined length of distal segments. Tibia 1 with 23 subsegments. Tarsus 1 with 40 subsegments. Trichobothria, leg 4: basitarsus 3 proximal, 13 distal (apicodistal 3, laterodistal 5, 5); tibia, distal segment 1.

Genitalia: lateral lobes large, partially divided into a larger inner and a smaller outer part. Medial lobes slightly smaller, tapering distally, triangular. Ventro-medial lobes (adjacent to sclerotized lateral lobe bases) short and rounded. Dorsal lobes short and blunt.

Material Examined: Males: the metallotype only. Females: 4, 2km WNW of Cape Tribulation, Queensland, 23.9-7.10.1982, Monteith, Yeates and Thompson; 3, Barron Falls, near Cairns, Queensland, 3.9.1901, C. Hedley; 2, 50km north of Cairns, Queensland, 28.12.1969, N. C. Coleman.

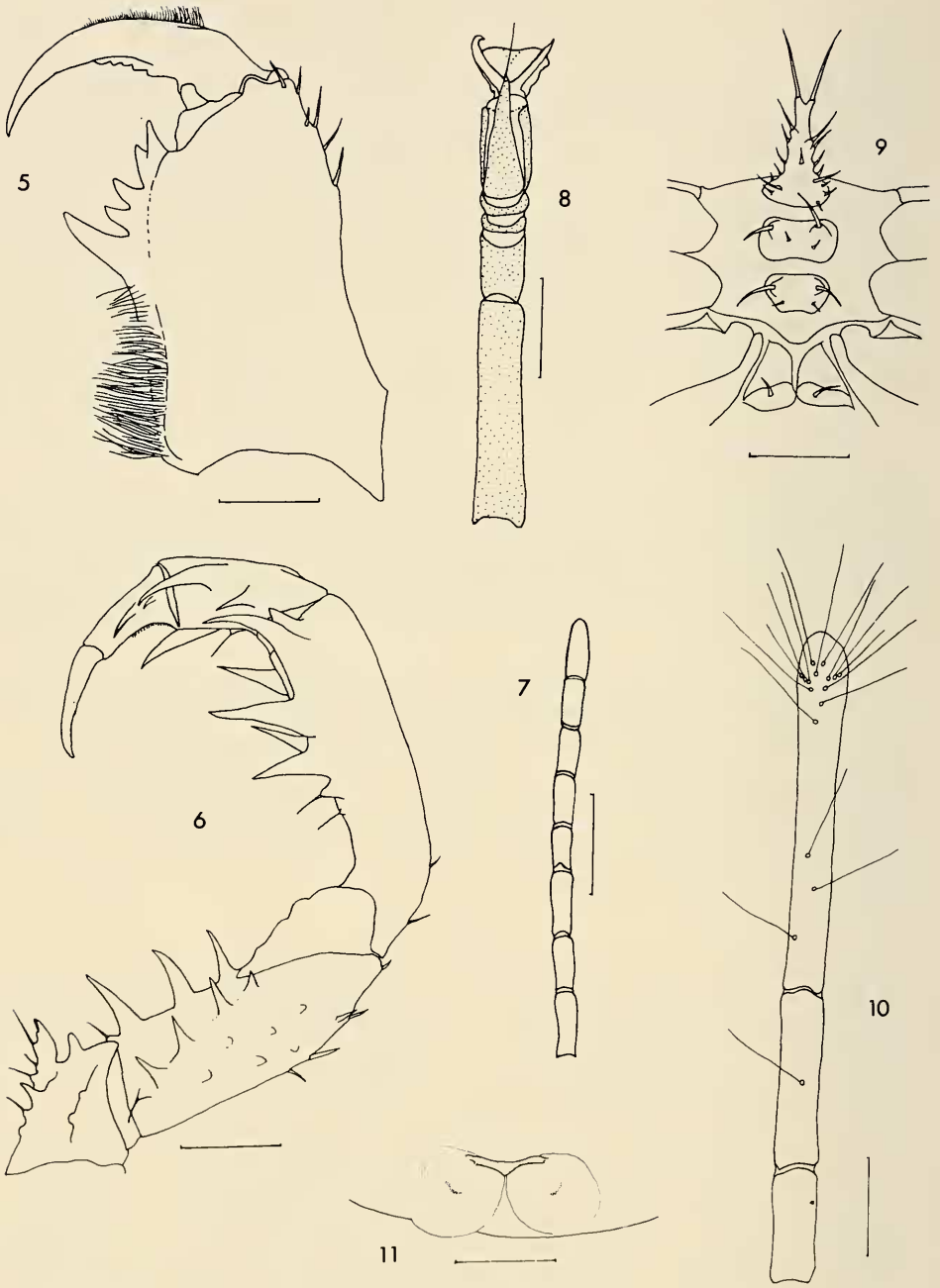
Behaviour

Specimens of the Tailless Whipscorpion *Charinus pescotti* Dunn, 1949 were collected in lowland rainforest at 'Gap Creek farm', Bloomfield River district, north Queensland. All were found on the under surface of stones or logs, never on the substrate below. Gravely (1915) records similar behaviour in Ceylonese tarantulids. They occurred singly except where associated with a rock or log greater than ca 130cm diameter.

The specimens collected for behavioural study were as follows: 2♂♂, 4 ovigerous ♀♀, 1♀ with young on the back, and 2 immature specimens.

Initially a male, a female and a juvenile male were maintained in a perspex container measuring 12cm × 12cm × 15cm high for detailed observation of feeding and breeding behaviour. Later five adults (1♂, 4♀♀) were moved into an aquarium measuring 62cm × 31cm × 37cm high. Captive conditions were arranged similarly to wild conditions with stones, sections of old termite eaten wood (*Ficus* sp.) and dampened 50/50 leaf mulch, soil mixture. Pieces of *Helxine* sp. were added to simulate the forbs of the forest floor.

Live food consisted of flies (family Phoridae), Collembola (family Poduridae), and young isopods *(Porcelio scaber)* all of which bred in the containers. This was supplemented with Vinegar Flies, *Drosophila melanogaster.* No dead food was observed taken.



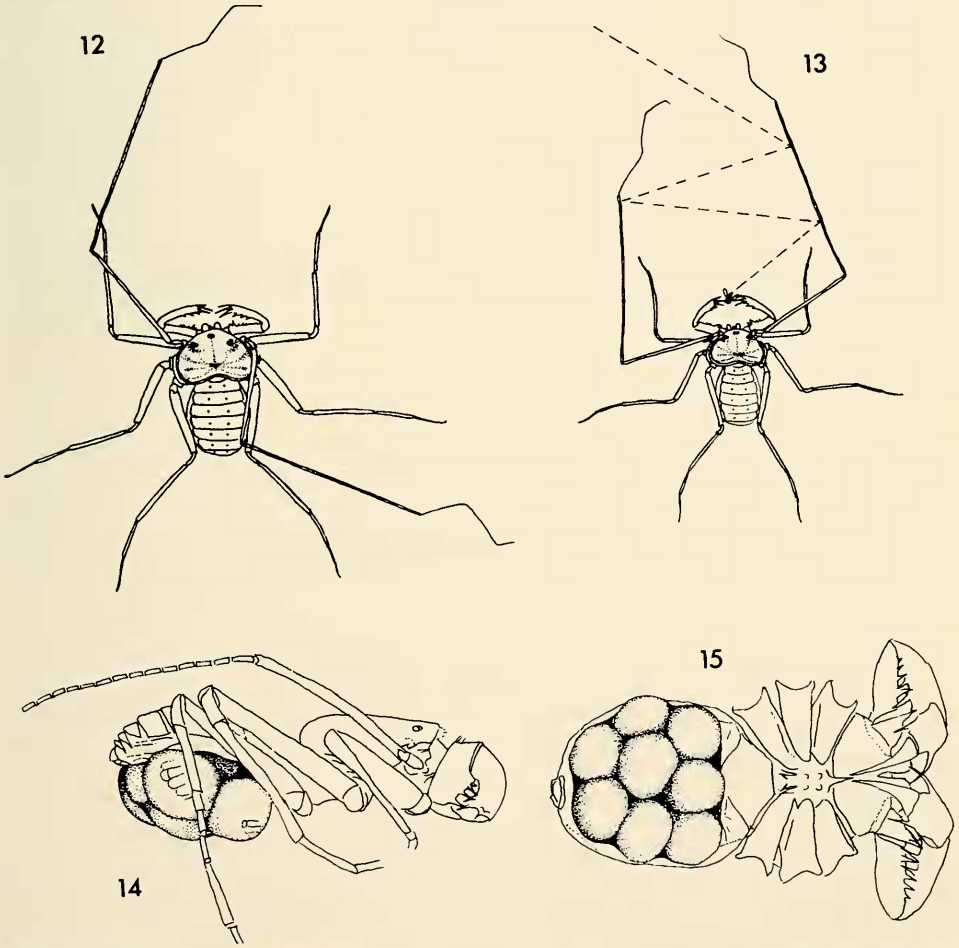
Figs 5-11. Charinus pescotti, female. Scale lines = 1mm. 5. Chelicera, retrolateral. 6. Pedipalp, prolateral. 7. Leg 1, distal tarsus. 8. Leg 4, tarsus. 9. Sternum and ventral pedicel. 10. Leg 4, tibia. 11. Genitalia, ventral.

High humidity was maintained and the containers were kept under natural lighting except when nocturnal observations were made. Nocturnal observation used normal room lighting with occasional use of a penlight torch.

(a) **Feeding behaviour**

Under captive conditions it became clear that not only does each individual have its own nocturnal feeding site and daytime retreat unshared by others, but aggressive encounters are minimal with almost no physical contact between individuals. If an aggressive adult male advances into the feeding site of a female or juvenile the length of the whips ensures the subordinate individual of early warning and it retires accordingly. It is only in confined areas (e.g. collecting tubes) that damage in the form of lost whip tips and (in extreme cases) legs below the patella has been observed. When newly-independent young are present cannibalism occurs readily, but this has never been observed amongst individuals of similar size.

At night individuals moved out onto the side or upper surface of their retreats and took up feeding stances. The substrate was used only to cross from one daytime retreat to another. At no time was feeding observed during transit. If an individual was chased off its feeding site it would adopt a feeding stance on the glass or perspex sides of the container.



Figs 12-13. Charinus pescotti, feeding behaviour. 12. Hunting position. 13. Prey capture by 'herding' with first leg 'whips'.
Figs 14-15. Charinus pescotti, female with embryos in abdominal brood pouch. 14. lateral. 15. ventral.

The legs, particularly the long first pair, are the primary sensory structures of the amblypygids (Weygoldt, 1972b; Foelix *et al.*, 1975). In *C. pescotti* the eyes seem to be of little use in detecting prey or predators, although Gravely (1915) has suggested such use in an Indian amblypygid. The first legs or 'whips' are often swept toward a moving object before it can be reached, suggesting vibrational or air current sensitivity.

In the feeding stance (Fig. 12) *C. pescotti* usually raises its body some 2mm above the substrate (in contrast to its more depressed resting stance), with a slight downward slant anteriorly. The pedipalps, although folded, appear to be turned slightly forward at the coxa-trochanter joint and are slightly opened at the armed ends. The whips are swept backwards and forwards at an angle approaching, or greater than 90° to each other so that one is usually pointing laterally while the other points anteriorly, thus covering the front and both sides without the need to move the body. Gravely (1915) records similar behaviour for *Phrynichus ceylonicus*. The ends of the whips are remarkably flexible and can easily trace a circular path at their tips or point back along their length (Figs 12, 13). Consequently the tips never appear still even though movement is slow. This stance, immobile except for the whips, is usually kept up for an hour or more before either prey is caught, reorientation in another direction occurs, or some other stimulus disrupts the procedure.

Once the nearby movement of potential prey is detected, one or other of the whips is moved towards it. As soon as the whip touches it the prey usually moves away at a tangent to the whip axis. Assuming it to be within the area enclosed by the whips it then encounters the other whip being moved rapidly towards it. This then causes the prey to move back towards the first whip and the process is repeated. As the whips are being flexed at the patella towards each other the result is that the prey pursues a zig-zag path towards the strongly-armed pedipalps. When within range both pedipalps flick out very rapidly and hook the prey into the chelicerae (Fig. 13). The use of the whips for detecting prey presence and of the pedipalps for grasping prey is well known (Cloudsley-Thompson, 1985; Alexander, 1962; Weygoldt, 1972a). However, the use of the whips for 'prey herding' prior to capture appears to be unrecorded.

If the prey is first contacted at the end of the whip up to three further contacts can be required before the prey is herded into range of the pedipalps. In the case of phorid flies the above action can be quite rapid and is somewhat reminiscent of a pinball machine. The ends of the whips often curl inwards if the prey moves off at an angle which might take it outside their range. Prey which comes in contact with the outer edge of the whip (i.e. outside the angle formed by the two whips) is often lost but an attempt is usually made to get it between the whips.

The rapid movement of the pedipalps during prey capture and occasional sideways darts to avoid unpleasant stimuli were the only fast movements observed. All other movements are slow and deliberate with constant local reconnaissance by the sweeping whips. The whips are thrust into any crevices prior to the animal entering (characteristically sideways). Possibly prey is also located and caught in this manner although this was not observed.

Large prey is avoided by *C. pescotti* and most prey taken was small in size — the largest capture was a newly moulted (and therefore soft) slater *P. scaber*, 6mm body length, by a male specimen approximately 9mm body length. Appetites do not appear to be voracious and often several days elapse between meals, especially in colder weather. The young feed on the same (but smaller) prey as adults. Prey was never seen to be chased — it was always a matter of prey coming to predator.

(b) **Breeding observations**

No complete courtship or mating was ever witnessed. In late December 1982 a captive male specimen was observed slowly investigating a female with his whips. Normally she would have vacated the area of his close proximity. However, in this case she

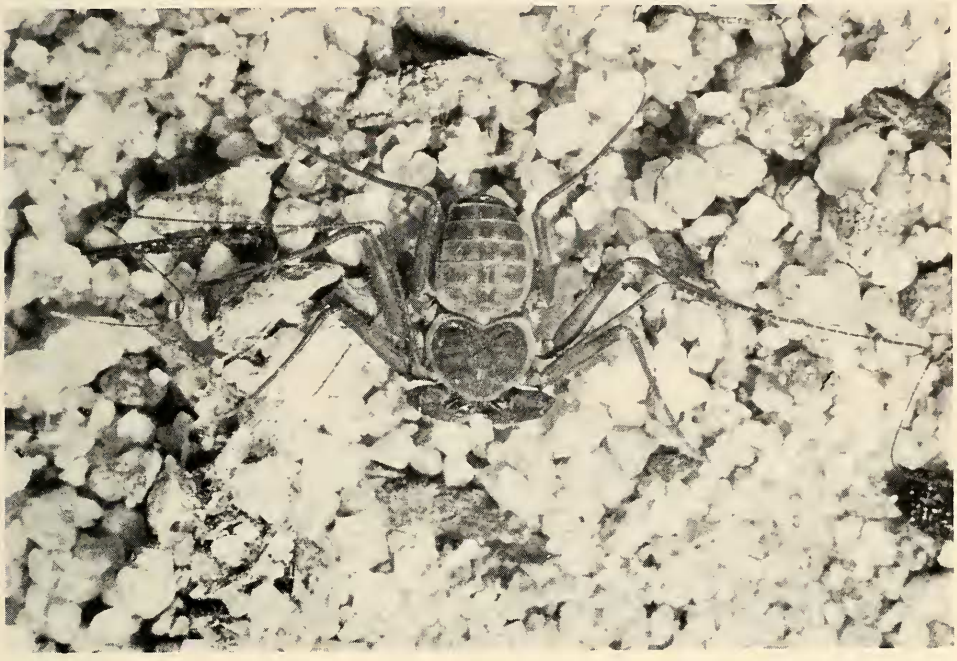


Fig. 16. Charinus pescotti, female.

remained inactive for almost a minute before moving off. The male did not follow and this behaviour was not observed again.

Most of the reproductive activity at the Bloomfield collecting site seems to occur in late December-January. On 6th January 1983 all adult females observed in the field were either ovigerous or carrying young. No newly independent young were noticed at this time. The young seem mostly to have dispersed by February just before the start of the wet season. Ovigerous females from other areas have been collected from late September to late December.

In the ovigerous females the developing eggs are visible as somewhat depressed hemispheres on the underside of the abdomen (Figs 14, 15). They are completely covered by a transparent membrane, the brood sac. These hemispheres become very obvious in the later stages of development. The females at this time carry their abdomens at a definite upward tilt.

Three ovigerous specimens from Cape Tribulation, north Queensland and one from the Mossman area proved to have 7, 8, 11 and 16 eggs respectively. Egg diameters ranged from 1.45-1.80mm. Developing embryos were visible through the walls of the largest eggs. Cloudsley-Thompson (1958) records egg size of 2-3mm and noted that the number of eggs may vary from 7 to 80 or more, depending on the size of the mother. *C. pescotti* therefore is within the range of the smaller brood sizes recorded. A maximum of only 5 young (average 4) were recorded as being carried by 7 Bloomfield specimens. This could indicate either that different populations may have different brood size

ranges or that not all young survive. Gravely (1915) noted that not all embryos develop successfully. The strategy here seems to be a reversal of the usual invertebrate trend of producing a large number of small young. The young, white on emergence from the brood sac, are quite large, the Bloomfield specimens averaging 0.7mm carapace width as compared to 3.6mm for adult females.

After emergence the young congregate mainly on the mother's abdomen. Due to their large size they must wrap around the abdomen and each other. Usually within a week they undergo their first moult, gain pigment on the cephalothorax and abdominal segments, and disperse.

On two occasions the original female produced two broods in one season. Both times the broods were observed in early January and late January—early February. Whether this occurs in the wild could not be determined. The females can also survive at least into a third breeding year. These two factors may provide a counterbalance to the small brood size. Growth to maturity appears to be slow, certainly exceeding 12 months. Gravely (1915) records *Charinides bengalensis* as taking at least 3 years to reach maturity at a carapace width of 3.5mm. *C. pescotti* has an adult carapace width of 3.54-4.67mm.

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